A critical appraisal of "A cognitive-motor intervention using a dance video game to enhance foot placement accuracy and gait under dual task conditions in older adults: a randomized controlled trial"

By

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Abstract

Motor and cognitive functions are very important in everyday activity. As a physical therapist, we will be treating many patients that have lost either their motor or cognitive functions. In this article, the researcher proposed the idea of incorporating the use of interactive video game to improve the foot placement and gait analysis of patients in the older generation. The experiment recruited a group of elder adults and divided them into two different group, one serves as the experimental group with interactive video game as part of the exercise routine and the other one served as the control group with only physical exercise. In this critical appraisal, I determined the credibility of the article, evaluated the paper's strength and weakness of each sections. Overall, the research paper provided a good example of how to set up tests to determine the benefits of interactive video game with physical exercise and provided ideas for future study base on its results. It serves as a good reference and an example of what to focus on and what not to do for future researches relating to the idea of using video games as an effective supplementary source to traditional therapy to improve cognitive and motor performances of patients.

Key words: Interactive video game, Gait, Older adults, Cognitive-motor intervention, Critical Appraisal

Introduction

Motor and cognitive functions very important in everyday activity. As a physical therapist, we will be treating many patients that have lost their motor or cognitive functions. Normally we will be using exercise interventions that incorporate muscle strength and posture control for these kinds of patients. But physical exercise alone cannot improve the cognition functions and sometimes patients do not have the motivation to continue the exercise due to lack of interest. This research suggested interactive video games can be used as a simple and motivating way to incorporate cognitive elements into a physical therapy program. The paper serves as a good reference and example of what to focus on and what not to do for future researches relating to the idea of using video games as an effective supplementary source to traditional therapy to improve cognitive and motor performances of patients.

Methods

In searching for data related to the use of interactive video games to improve motor control and cognitive function of patient, several different databases were suggested. The database I ended up using is the Pubmed.gov since it is a free database accessing primarily research articles relating to life sciences and biomedical related topic. To search the paper I was looking for, I used keywords including video game, cognitive, motor, and performance. Then I incorporated limits to find full text articles that were published within the last 10 years that have performed research based on human to get the most recent and still valid articles that may perform clinical research on human subjects for validity. With the help of the database and finding population that targets subjects require cognitive or motor improvement with the intervention of video games to the therapy, I was able to find 53 articles.

With the hits the database provided with my information, I looked at the type of research performed in each paper that is not a review article. In order to find valid articles, I look through the potential article's journal's impact factor, the study's goal, and the subjects the research was targeting. This article I am writing the critical appraisal for is from a credible journal, the BMC Geriatrics, with a decent 5-year impact factor of 3.458. The paper conducted a well-organized study that includes participants within a similar sociodemographic status and were randomized into different groups. Although some subjects did withdrawal from the study, but this occurs before the randomization process begin, thus it won't affect the outcome of the study. The only difference between the study is the intervention of video games in the experimental group. Based on these evidences, I believe this is a good research paper for a comprehensive critical appraisal

Results

Summary of the study

As the population of elder adult increases each year, falling becomes a common problem. Common daily activities require both sensorimotor process and higher cognitive functions, therefore the maintenance or the rehabilitation of cognitive function is also needed with regular physical exercise. Exercise interventions that to improve muscle strength and posture have been often recommended for older adults, but physical exercise alone cannot address the cognitive function. This study believes a simple and motivating way to incorporate cognitive elements into physical activity is with the use of interactive video games. The study was designed as a randomized controlled trial in a four months period. Two training groups that achieve similar amounts of physical strength and balance were compared, where one group additionally performs dance video game training. The result of the study showed significant differences in favor of the dance group in gait-related tests, but no significance in other tests. The study

concluded that in older adults a cognitive-motor intervention may result in more improved gait in comparison to traditional strength and balance exercise program.

Appraisal of the study introduction

The introduction provides a detailed background for the study and explains why cognitive motor control is important, especially in older adults. The author used several credible articles from sources such as Gerontology and Archives of Physical Medicine and Rehabilitation with high impact factors to support their claim. This introduction explained the aim of the study and provided the idea with the use of dance video game training to improve foot placement accuracy gait under single and dual-task conditions, and on fear of falling.

The author mentioned several different articles to reinforce his points in the introduction, although some referenced articles are from an older time, but they were relevant when this article was constructed. However, some articles may not be relevant because they are from more than 20 years ago, such as references 1, 8, 19, 36, 37, and 40.

Appraisal of the study methods

The study was designed as a prospective randomized controlled experiment in a duration of four months. A total of fifty-two subjects were recruited with thirty-five of them showed interest in the experiment. But four subjects withdrew before the study started. The study is specific for their target subjects, they have recruited older adults within the same sociodemographic. The collection of the data is concise with references and graphs to help the readers to support the understanding of the data collection process.

Due to the study's complexity, the blinding of clinicians was not possible due to supervision and conduction of the training sessions. In general, the instruments and outcome measures are described in detail with the support of literature references, but the Falls Efficacy Scale Internationals were not

detailed enough to be sufficient. The greatest weakness of the research's method would be the small sample size, which may affect the result and cause the conclusion to be invalid. Another weakness of the study would be the intervention they used with the interactive video game. The intervention was not given in too much detail. Only mentioned a progressive video game dancing program is used. Although it may be replicated, but with the use of a different video game dancing may cause variation in the results.

Appraisal of the study results

The result section follows the same order as the research question and procedures mentioned in the method section, make it easy to narrate and compare between the two sections. The author addressed the hypothesis, incorporate a study flow chart to show a clear step of each data collection, and table shows a clear comparison between the experimental and control group.

One weakness of the result section is that it did not mention any concept about the minimal clinically important difference for the study to show how the clinical intervention would be meaningful to the patient.

Appraisal of the study discussion

The author explains every individual method's result and provided their own opinions base on those results and what may be the limitation of the research. The results were explained with other research papers to support them. The discussions did mention the research's limitations and how they may be able to improve the study and provided ideas for future studies mainly focus on the effect of video game intervention on cognitive function alone. At the end of the discussion, the findings suggest exercise program that aims to improve physical functions under dual-task conditions should be considered a

cognitive challenging element. And with the integration of interactive video game is a good addition to strength and balance exercise.

The one weakness in the discussion section is the use of one outdated reference to support the claim the author tried to make.

Discussion

It is known that cognitive decline is a problem in the elder population, thus it is important to keep them engage in a more cognitive related exercise to maintain their cognitive function. With the incorporation of the video game, patients may be more engaged and motivated compare to regular exercises. This study shows a significant difference in cognitive-motor improvement by the intervention of interactive video games with physical exercise and helps answer my clinical question about the effectiveness of video games in improving cognitive and motor performance in patients.

In this research, the use of interactive video games as an intervention with physical exercise showed a significant difference from the group that only uses physical exercise. The hypothesis for improvement of foot placement and gait analysis showed significant differences favoring the experimental group compare with the control group. And besides the data provided, the paper also mentioned the dance group members were motivated by additional playing of the video game at the end of every training session. In contrast, the control group members were also motivated by the assurance that after the end they had the opportunity to include dance video games in the exercise program as well. One way to make this a valid intervention is to collect more data for the research, either by replicating it in larger sample size or perform another research base on certain video game's effects on cognitive function.

The use of video games as an intervention for physical therapy, in theory, is helpful in improving cognitive function of the patients and may also motivate them to perform exercise and treat it as a game instead of workout. I believe this study shows the potential to incorporating video game in some types of exercise to motivate patients that do not like to work out or cannot leave their home. This type of intervention can be used either in the clinic with other patients or at home with other family members. The researchers used dancing video games, however not much detail was mentioned, so it may be difficult to replicate the environment and produce the same cognitive improvement the research is aiming. If there are other researches using other types of interactive video games or confirmed different types of video game may produce the same effect on improving cognitive effect, then it would be a safe and easy way to set up a routine exercise. But the research's sample size is too small for it to be valid, this may make the patients in doubt of the intervention.

Overall, the research provided a good example of how to set up tests to determine the benefits of interactive video game with physical exercise and provided its own limitations of the study. Although the research has its own limitations due to several factors, it also served as a good guide for future study in related interventions.